**Planned milestones, reasons for deviation from milestone and actual achievements**

This section provides updates from partners on outputs from different partner institutions’ planned milestones and deliverables which were planned from October 2019 through March 2020.

*Sub-activity GH1111-19: Cowpea living mulch effect on weed control, soil properties and maize yield (Lead Institution: IITA) and*

*Sub-activity GH1112-19: Optimizing on-farm nitrogen (N) fertilizer use efficiency under rainfed conditions and leaf stripping for livestock feeding in maize-based cropping system (Lead Institution: IITA)*

**Achievements (progress and/or results) against outputs towards outcome 1**

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | 1. Establish 2 agronomic research activities: (i) Cowpea living mulch and maize maturity type effect on yield and weed control in maize-based cropping system (ii) Optimizing on-farm nitrogen (N) use efficiency under rainfed conditions  2. Organize community-field days to access farmer preference and perceptions on the above technologies using the SIAF. | 1.1 Agronomic data was collected  1.2 Publish results of agronomic research activities in a peer review journal or conference proceeding.  2. Data on gender perception and preferences for the technologies were collected | 1.1 Targeted number of farmer field trials for the cowpea living mulch and N fertilizer trial were not achieved due to late start of the research activities.  1.2 No publication for results on optimizing on-farm N use efficiency under rain-fed condition because first year study result is not complete.  2. No deviation from milestone | 1.1 Farmers have identified the right time of planting cowpea as living mulch in maze cropping system to conserve soil moisture and smoother weed growth.  Farmers are well informed about maize variety with regards to their maturity days and when to plant a maize variety depending on the cropping calendar of the season.  Farmers have identified the best and efficient time to apply basal fertilizer to maize crop.  1.2 Abstract on cowpea living mulch trial accepted for presentation at plant health, Agriculture & Bioscience Conference (PHAB), September 2020, The Hague, Netherlands  2. Farmers have assessed the sustainability of cowpea living mulch technology and selected their preferred cowpea living mulch, maize variety, fertilizer type and time of application of basal fertilizer in maize. The feedback is use for proper planning and scaling. |
|  | 1.Measurements of N2O from the experimental sites  2.Measurement of NH3 fluxes from the experimental | 1. Provide data on N2O fluxes from fertilized fields  2. Determines NH3 fluxes from fertilized fields | 1.Could not measure the N2O fluxes due to our in ability to purchase the insitu infrared N2O measurement equipment | The study established that:  1. Application of new fertilizer blends tested emitted low NH3 fluxes that is not enough for maximum N loss to affect N availability to crops.  2. Application of undecomposed organic material alone as well as together with inorganic fertilizer facilitates higher NH3 emissions that could lead to significant N losses.  3. The impact of temperatures on NH3 emissions in the Guinea Savanna agro-ecology is minimal as temperatures remain averagely the same throughout the growing season  4. Low NH3 recorded agrees with level of soil pH recorded from experimental sites. |

*Sub-activity MA1111-19: Evaluating crop simulation models using different fertility sources and climate model outputs to improve the productivity of sorghum (Lead institution: ICRISAT)*

| **Project Outcome 1: Outcome 1:** Farmers and farming communities in the project area are practicing more productive, resilient, and profitable and sustainably intensified crop-livestock systems linked to markets. | | | | |
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| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners  Activity 1.1.1: Test a combination of climate-smart crop varieties and agronomic practices to increase and sustain food and feed production | Sub-activity MA1111-19: Evaluating sorghum crop simulation models using different fertility sources and climate model outputs to improve the productivity of sorghum | 1. Best fertilizer management practices that will contribute to increased sorghum productivity. 2. At least 300 farmers will be reached, trained and sensitized via farmers’ field day on fertility micro-dosing technology. 3. Crop simulation Models (DSSAT and APSIM) outputs under different fertilizer scenarios to future climatic conditions. 4. Economic cost and benefit analysis of sorghum under different fertilizer management application performed. 5. Technical reports and conference paper prepared. 6. Manuscript on improving grain sorghum productivity in water-limited environments under climate change. 7. Finalization of the West Africa Handbook in collaboration with the co-authors as a team | There are no  deviations from the planned milestone. | 1. On-station field experiments completed at three research sites representing three agro-ecological zones (Bamako, Bougouni and Koutiala). Result reported in this interim report. 2. Field days were organized in collaboration with partner institutes both in Koutiala and Bougouni Technology Park. The field days attracted over 600 participants that included researchers, farmers, extension agents and other stakeholders. 3. Calibration and validation of DSSAT and APSIM model for the selected varieties is on-going. 4. Economic analysis of different rates and types of fertilizer application was conducted and included in this report. 5. Publication :   <https://www.sciencedirect.com/science/article/pii/S0378429018313625>   1. Technology handbook chapter submitted to the chief scientist for review. |

*Sub-activity GH1113-19: Assessing the potential for a combination of local Napier grass fodder species and pigeon peas for improved soil health and ruminant productivity in the Guinea savannah zone (Lead Institution: UDS-Faculty of Agriculture)*

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output 1.1** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, and vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | Planned Activities  Assessing the potential for a combination of local Napier fodder species and pigeon peas for improved soil health and ruminant productivity in the Guinea savannah zone. | Planned Milestones  1. Data on agronomic and gender preference for technology  2. Cost-benefit and labor input data  3. Data on fodder yield in relation to ruminant productivity  4. Training of farmers  5. Soil health data in relation to Napier and Pigeon pea intercrops  6. Presentation of results at Ghana Animal Science Association conference | Deviation from Planned Milestone  No deviations | Achievements towards Output  Both agronomic and pigeon pea and fodder yield data compiled  Chemical and nutrient analysis of fodder results compiled  Farmers trained  Technical report submitted |

*Sub-activity MA1113-18: Evaluating improved dual purpose sorghum for crop-livestock integration and income generation in Sikasso Region/Mali ((Lead institution: ICRISAT)*

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, and vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | Sub-activity MA1113-19: Evaluating improved dual purpose sorghum for crop-livestock integration and income generation in Sikasso Region/Mali | 1. Finalization of the west Africa handbook in collaboration with the co-authors as a team: (Sorghum hybrids) under Chapter 1  2. Finalization of the technology handbook contribution in collaboration with the co-authors as a team: (Dual-purpose sorghum) under Chapter 1  3. Scientific article submitted (with 2-year data) Agronomic and economic values of dual-purpose sorghum varieties in Bougouni and Koutiala zones in Mali. Experimental Agriculture  4.Report on farmers perception of varieties | 1. Draft document submitted to the chief Scientist  2. To be completed in May 2020).  3. Economic assessment not yet conducted and planning is on-going with the economist  4. Report included in the current interim report) | Variety participatory evaluation trials were implemented with 4 new dual purpose sorghum hybrids compared to the released hybrid Fadda and a local variety. All the four new hybrids showed grain yield advantage varying from 6% (ICSX17651145:H) to 16% (ICSX 1765232:H) compared to Fadda (3.2t/ha). Farmers prefer two more hybrids ICSX 17651145:H (67%) and ICSX 1765505:H (64%).  At ICRISAT-Samanko research station, the dual purpose sorghum varieties: Soubatimi and Peke, selected in the Africa RISING villages in 2018 were evaluated with 2 types of fertilizers (DAP+urea and cow manure) compared to no fertilizer under controlled environment. Three sowing dates were also included to provide the best combination to maximize the grain and stover yield and mitigate production risks. Data including crop growth, yield and canopy parameters were collected and used to parametrize APSIM and DSSAT models. The experiment will be repeated in 2020 agronomic season and the final result of the modelling work will help to determine the performance region of the improved variety Soubatimi and Peke in outside Africa RISING intervention villages. |

*Sub-activity GH1114-19: Use CCAFS’ Climate-smart village approach to mainstream climate variability in the promotion and dissemination of Africa RISING SI interventions for sustained productivity and reduced risk in Ghana (Lead Institution: SARI)*

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | 1. Baseline assessment, including climate risk analysis and gender and social inclusion analysis;  2. Focus group discussion to generate data on social SI indicators and farmers’ views about climate change and variability in general.  3, Participatory identification and prioritization of Africa RISING SI technologies based on biophysical, socio-economic, gender, policy and institutional context; also considering possible synergies and trade-offs amongst individual activities;  4. Provision of climate information services to farmers using climate forecast communication  5. Evaluation of portfolios of Africa RISING SI technologies (e.g. providing value-added weather services to farmers, building capacity in climate change adaptation and facilitating community partnerships for knowledge sharing);  6. Capacity building for the scaling up of climate-smart interventions through policies and institutions, and scaling out to large areas through farm-to-farm approach  7. Verification demonstrations conducted on two seedbed types (flat vs. tie ridges or Ridges vs. tie ridges) in each community.  8. Verification demonstrations conducted on flat vs. earth bunds in each community. | 1.Baseline assessment report  2. Data sets generated for Focus group discussion  3. Prioritized list of AR SI technologies  4. Activity report submitted  5. Best soil and water managemnet that will contribute to increased crop productivity  6. Economic cost and benefit analysis of crop under different soil and water management application performed.  Training of at least 200 farmers on CSA  7. Draft journal article and policy brief  8. Contribution towards finalization of West Africa Handbook | There are no deviations from the milestones | Baseline assessment including climate risk analysis and gender and social inclusion analysis is being prepared  Focus group discussion generated data on social SI indicators and farmers’ views about climate change and variability in general have been evaluated and a Report has been shared.  . |

*Sub-activity GH1115-19: Identify varieties and post-harvest management options of vegetable crop species with adaptation to Northern Ghana in the dry season (Lead Institution: WorldVeg)*

*Sub-activity GH1116-19: Determine yield and post-harvest quality of vegetables as affected by improved soil and water management practices in the dry season in Northern Ghana (Lead Institution: WorldVeg)*

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, and vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | Planned Activities Sub-activity GH1115-19:  Test and disseminate livestock and integrated crop-livestock technologies and practices to increase and sustain the productivity of smallholder crop-livestock farming systems | 1. Optimized manure application option improving tomato nutrient qualities during postharvest storage in the ZECC determined for UER and NR.  2. Zero energy cooling chambers constructed and evaluated  3. Field days & participatory variety selection organized  4. Database on vegetable yields, disease performances under different manure application options and storability  5. Database on farmers training and trial establishment | 1. No 2. No 3. No   4.N/A  5. N/A | Achievements towards Output 1. Tomato, pepper and onion varietal trials were conducted in five lead farmers hub (Each experiment had four replicates) in Nyangua and Tekuri (Tables B.1.1.1 to B.1.1.3 & Fig B.1.1 to Fig B1.1.2**)**. Disease screening trial was also set up in one lead hub to screen 16 and 24 accessions of pepper and tomato. Ninety-seven (97) non-lead farmers established baby trials in three non-lead farmers’ fields (Doku, Bonia, Gia) (Table B.1.1.3 & Fig B.1.1.5).  2. Four varieties of tomatoes (Pectomech, Tropimech, UC82 and Local) from which forty (40) fruits from each variety was tested in the ZECC (Fig B.1.1.6 to Fig B.1.1.11). A total of two hundred and forty (240) tomato fruit samples from twenty-four accessions of tomatoes were also analysed for quality traits such as Total Sugar Solute, Titratable acidity, Moisture content and Colour.  3. Three field days were organized during the construction of the ZECC experiment.  4. The trials and tests are on-going. The data will be posted at the end of the trials  5. The trials and tests are on-going. The data will be posted at the end of the trials |
|  | 2. **Sub-activity GH1116-19**  Yield and post-harvest quality of vegetables as affected by improved soil and water management practices in the dry season in Northern Ghana (Niangua, Tekuru, | 1. Optimized manure application option improving tomato nutrient qualities during postharvest storage in the ZECC determined for UER and NR.  2. Zero energy cooling chambers constructed and evaluated  3. Field days & participatory variety selection organized  4. Database on vegetable yields, disease performances under different manure application options and storability  5. Database on farmers training and trial establishment | Agronomic trial could not be established at Tamale due to challenges in adequate water source  2. No  3. It is scheduled for April 2020.  4.N/A  5.N/A | 1.One agronomic trial in one lead hub at Navrongo (Nyangua) was established  2. Four energy cooling chambers constructed on Nyangua and Duko. Post-harvest trials on going for variety tested in activity GH1111-1901  3. Field days were organized at Transplanting and Fertilizer application. A total of 87 (42 m and 35F) participated in both trainings at Upper East and Northern Region (Table B.1.1.4)  4. The trials and tests are on-going. The data will be posted at the end of the trials  5. The trials and tests are on-going. The data will be posted at the end of the trials |

*Sub-activity GH1121-19: Efficient feed utilization through improved feed troughs (Lead Institution: ILRI)*

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| **Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, and profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output1.1 Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, and vegetables); livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners in the intervention communities. | Activity 1.1.2  Test and disseminate a combination of improved breeds, housing, feeding, health and breeding practices to intensify rearing of livestock (sheep, goat, pig, and poultry) for meat, egg and milk production.  Sub-activity GH111-19  Efficient feed utilization through improved feed troughs | 1. Report of findings on testing and evaluation of the improved feed troughs compared to those built with locally available materials – March 2020  2. Data on use of improved feed troughs – March 2020  3. Data on nutritional value of feed offered and leftovers – March 2020  4. Data on manure collected – March 2020 | No deviation from the planned milestones. | -Collection of data on use of the improved feed troughs across all seasons has been completed in the 3 intervention communities.  -The report on the use of improved feed troughs is being prepared and will be ready by 30 April, 2020.  -Samples of feed offered and leftovers in the late dry season have been analyzed at ILRI NIRS lab in Burkina Faso. Additional 56 feed samples collected in the wet and early dry seasons are yet to be analyzed.  -Data on manure was collected in the wet and early dry season.-Eighteen faecal samples were collected for lab analysis which is yet to be done. |

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| **Outcome 3: Farmers and other value chain actors have greater and equitable access to production assets and markets (input and output) through enabling institutions and policies.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 3.1 Improved policies and institutional arrangements to increase participation of farm families, especially women and youth in the output and input markets and decision-making are developed | Activity 3.1.1  Identify constraints to and opportunities for improving access to the output and input markets by women and youth in the target area.  Sub-activity GH311-19  Strengthen the technical, managerial and organizational capacities of the major actors in small ruminant value chain through existent institutional structures such as Farmer-Based Organizations (FBOs), District Assemblies (DAs), Community Based Organizations, Traders Associations, Transporters and Input Dealers Association | 1. R4D Platforms established in Kassena Nankana Municipal and Kassena Nankana West in Upper East region, and in Wa east and Wa west in Upper West region – August 2019  2. Prioritization workshop report – Sept 2019  3. Baseline survey report on the platforms – Nov 2019  4. Report on the operations of the platforms – March 2020  5. Training handbook on building the capacity of small ruminant value chain actors – March 2020 | There is deviation from the planned milestones due to delay in commencement of the planned activities. | -Two Innovation Platforms have been established and R4DP in Navrongo identified  - Prioritization workshop report available and a number of recommendations for strengthening small ruminant value chain have been proposed.  - Meeting was held with Upper East Region Director and Unit Heads in the Department of Agriculture.  -Training workshop was organized for two female and 19 male Africa RISING farmers in Kassena-Nankana Municipal on increased small ruminant productivity.  -Eight small ruminant breeding males were supplied to eight best farmers in four Africa RISING communities in Wa West District for breed improvement  -Eight best small ruminant producers in 4 Africa RISING communities were each supported with GHC 400 and and guided in the construction of model small ruminant houses in their respective communities  -Phone numbers were exchanged between farmers in 4 Africa RISING communities in Wa West District and the vet officers to facilitate access to veterinary service  - Preparation of the handbook on building the capacity of small ruminant value chain actors is in progress. |

*Sub-activity GH1211-19: Assessing buffer and adaptive capacity to harness the resilience of different farm types (Lead Institution: WUR)*

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.2: Integrated management practices and innovations to improve and sustain productivity and ecosystems services of the soil, land, water and vegetation resources are developed and disseminated with farmers and development partners in the intervention communities. | 1. GH121-1901 Assessing buffer and adaptive capacity to harness the resilience of different farm types | 1. MSc thesis student report: has been completed and submitted (delivery as planned in March 2020).  2. Scientific paper: in progress, a draft has been written, we expect to submit in May 2020 (delivery planned for Sep 2020). | 1. -  2. - | Field work and subsequent analyses have been performed. Report completed and paper is currently under development with good progress. |

**B.1. Achievements (progress and/or results) against outputs towards outcome 1**

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | Planned Activities  1.Measurements of N2O from the experimental sites  2.Measurement of NH3 fluxes from the experimental  3. | Planned Milestones  1. Provide data on N2O fluxes from fertilized fields  2. Determines NH3 fluxes from fertilized fields | Deviation from Planned Milestone  1.Could not measure the N2O fluxes due to our in ability to purchase the insitu infrared N2O measurement equipment  2.  3 | Achievements towards Output  The study established the following:  1. Application of new fertilizer blends tested emitted low NH3 fluxes that is not enough for maximum N loss to affect N availability to crops.  2. Application of undecomposed organic material alone as well as together with inorganic fertilizer facilitates higher NH3 emissions that could lead to significant N losses.  3. The impact of temperatures on NH3 emissions in the Guinea Savanna agro-ecology is minimal as temperatures remain averagely the same throughout the growing season  4. Low NH3 recorded agrees with level of soil pH recorded from experimental sites. |

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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners. | Sub-activity MA1114-19:  Evaluating and disseminating promising technologies tested in 2018 for performance and profitability to intensify vegetable production under rainfed and dry seasons  Sub-activity MA1114-1901: Conduct indigenous and exotic vegetable variety trials & demonstrations in the dry season  2.Sub-activity MA1114-1902: Test and demonstrate vegetable performance using sack gardens to enable more access to vegetables and generate income for women farmers in the dry season | 1. High performing vegetable varieties with farmers’ preferred traits identified  2. New disease-resistant tomato & pepper varieties identified in Bougouni & Samanko districts  3. Major vegetable diseases identified for Bougouni & Koutiala districts  4. Field days & participatory variety selection organized  5. A report on farmers training and trial establishment  6. Database on vegetables  7. Food security implemented  8. Gender preference for onion & vegetable cowpea varieties established  9. Finalization of the West Africa Handbook in collaboration with the co-authors as a team | 1. No  2.No  3. Due to insufficiency of seeds, the field diseases and pest screening trials for tomato and pepper were installed in Bougouni only.  4. Participatory variety selection for tomato, onion & African eggplant was planned at maturity (mid-March to mid-April 2020 but are facing restrictions for group work due to COVID-19 confinement requirement  5. The group training on post-harvest technologies and processing cannot be completed du to confinement. | 1. Four crops species with each 4 to seven varieties under demonstration on farm and field trials in the technology parks (Nampessola, Madina) with 126 farmers in Koutiala and Bougouni (Mali). Harvesting & data collection are on-going.  2. Twenty-four tomato and 16 pepper accessions/varieties of WorldVeg and other locally used varieties for control have been tested for resistance to diseases and pests in two sites in Mali (Samanko and Bougouni. Data were collected for diseases & pest damages. Analysis are on-going and report will be reported in the full report   1. Data were collected on major vegetable diseases. Data will be analysed and reported in the full report   4. Field days and participatory variety were implemented for the construction of the ZECC. Culinary tests were conducted for vegetable cowpea in Koutiala & Bougouni.  5. The training sessions were completed for 11 farmers in Bougouni & 101 farmers in Koutiala on good agricultural practices. |
| Output 1.2: Integrated management practices and innovations to improve and sustain productivity and ecosystems services of the soil, land, water and vegetation resources are developed and disseminated with farmers and development partners in the intervention communities. | Planned Activities  1.  2.  3. | Planned Milestones  1.  2. | Deviation from Planned Milestone  1.  2.  3 | Achievements towards Output    N/A |
| Output 1.3: Labor-saving and gender-sensitive technologies in target areas to reduce drudgery while increasing labor efficiency in the production cycle delivered. | Planned Activities  1.  2.  3. | Planned Milestones  1.  2. | Deviation from Planned Milestone  1.  2.  3 | Achievements towards Output  N/A |

**B.4. Achievements (progress and/or results) against outputs towards outcome 4**

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| **Project Outcome 4: Effective partnerships are built with farmers, local communities, and research and development partners in the private and public sectors to ensure delivery and uptake at scale of SI technologies, innovations and practices.** | | | | |
| Output 4.3: An updated framework for monitoring technology adoption to be used by the project team and scaling partners available and accessible. | Planned Activities  1. GH431-1901: Matching agricultural technologies to farms and their context | Planned Milestones  1. Journal article  2. Report  3. Datasets and algorithms | Deviation from Planned Milestones   1. - 2. The originally planned student report will be a technical report about the functioning of the algorithms on the datasets 3. - | Achievements towards Output  The scientific software engineer is applying the algorithms to the Ghana dataset that combines GIS and farm data. ARBES data have been inserted in a relational database that is available for all project researchers. An application has been developed to simulate the FarmMATCH mechanism as it could be applied by researchers and advisors. |
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| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, and profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
| Output 1.2: Integrated management practices and innovations to improve and sustain productivity and ecosystems services of the soil, land, water and vegetation resources are developed and disseminated with farmers and development partners in the intervention communities. | Planned Activities  sub-activity GH122-19:  Evaluate the technical and agronomic performance of Bhungroo and solar-energy drip irrigation system in the Upper East Region of Ghana. | Planned Milestones  • No milestone planned for this reporting period. The technical report will be ready as planned | Deviation from Planned Milestone  N/A | Achievements towards output  1. Field experiment executed (Annex 1)  2. Data collection is inprogress and it will be completed at the end of April 2020. |

**Mali Activities**

**Achievements (progress and/or results) against outputs towards outcome 1**

| **Project Outcome 1: Outcome 1: Farmers and farming communities in the project area are practicing more productive, resilient, profitable and sustainably intensified crop-livestock systems linked to markets.** | | | | |
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| **Output/ Activity** | **Planned Activities** | **Planned Milestones** | **Deviation from Planned Milestone** | **Achievements towards Output** |
| Output 1.1: Research products for more productive, intensive, diverse, profitable and resilient crop (cereals, legumes, vegetables), livestock (sheep, goats, cattle, poultry and pigs) and integrated crop-livestock farming systems are identified and disseminated to farmers through development partners  Activity 1.1.1: Test a combination of climate-smart crop varieties and agronomic practices to increase and sustain food and feed production | Sub-activity MA1111-19: Evaluating sorghum crop simulation models using different fertility sources and climate model outputs to improve the productivity of sorghum | 1. Best fertilizer management practices that will contribute to increased sorghum productivity.   1. At least 300 farmers will be reached, trained and sensitized via farmers field day on fertility micro-dosing technology. 2. Crop simulation Models (DSSAT and APSIM) outputs under different fertilizer scenarios to future climatic conditions. 3. Economic cost and benefit analysis of sorghum under different fertilizer management application performed. 4. Technical reports and conference paper prepared. 5. Manuscript on improving grain sorghum productivity in water-limited environments under climate change. 6. Finalization of the West Africa Handbook in collaboration with the co-authors as a team | There are no  deviations from the planned milestone. | 1. On-station field experiments completed at three research sites representing three agro-ecological zones (Bamako, Bougouni and Koutiala). Result reported in this interim report. 2. Field days were organized in collaboration with partner institutes both in Koutiala and Bougouni technology park. The field days attracted over 600 participants that included researchers, farmers, extension agents and other stakeholders. 3. Calibration and validation of DSSAT and APSIM model for the selected varieties is on-going. 4. Economic analysis of different rates and types of fertilizer application was conducted and included in this report. 5. Publication :   <https://www.sciencedirect.com/science/article/pii/S0378429018313625>   1. Technology handbook chapter submitted to the chief scientist for review. |
|  | Sub-activity MA1112-19: Understanding soil fertility management in cereal cropping systems in southern Mali. | 1. Household level nutrient flow data. 2. Model result on nutrient flow characterized across farm typologies. 3. Composting technology developed based on cotton stems; efficiency of compost application demonstrated. 4. Integrated soil fertility management practices under different input and nutrient flow conditions determined. 5. Finalization of the west Africa handbook in collaboration with the co-authors as a team: Technology 6: compost making. Chapter 3: Integrated soil fertility management | There are no deviations from the planned milestone | 1. A total of 45 farms were characterized and monitored from the three villages (Zanzoni, Sirakele and N’Golonianasso).  2. Chapter in technology handbook preparation is progressing well, to be submitted in May 2020. |
|  | Sub-activity MA1113-19: Evaluating improved dual purpose sorghum for crop-livestock integration and income generation in Sikasso Region/Mali | 1. Finalization of the west Africa handbook in collaboration with the co-authors as a team: (Sorghum hybrids) under Chapter 1 2. Finalization of the technology handbook contribution in collaboration with the co-authors as a team: (Dual-purpose sorghum) under Chapter 1 3. Scientific article submitted (with 2-year data) Agronomic and economic values of dual-purpose sorghum varieties in Bougouni and Koutiala zones in Mali. Experimental Agriculture 4. Report on farmers perception of varieties | 1. Draft document submitted to the chief Scientist  2. To be completed in May 2020).  3. Economic assessment not yet conducted and planning is on-going with the economist  4. Report included in the current interim report) | Variety participatory evaluation trials were implemented with 4 new dual purpose sorghum hybrids compared to the released hybrid Fadda and a local variety. All the four new hybrids showed grain yield advantage varying from 6% (ICSX17651145:H) to 16% (ICSX 1765232:H) compared to Fadda (3.2t/ha). Farmers prefer two more hybrids ICSX 17651145:H (67%) and ICSX 1765505:H (64%).  At ICRISAT-Samanko research station, the dual purpose sorghum varieties: Soubatimi and Peke, selected in the Africa RISING villages in 2018 were evaluated with 2 types of fertilizers (DAP+urea and cow manure) compared to no fertilizer under controlled environment. Three sowing dates were also included to provide the best combination to maximize the grain and stover yield and mitigate production risks. Data including crop growth, yield and canopy parameters were collected and used to parametrize APSIM and DSSAT models. The experiment will be repeated in 2020 agronomic season and the final result of the modelling work will help to determine the performance region of the improved variety Soubatimi and Peke in outside Africa RISING intervention villages. |
|  | Sub-activity  MA1114-19: Evaluating and disseminating promising technologies tested in 2018 for performance and profitability to intensify vegetable production under rainfed and dry seasons | 1. High performing vegetable varieties with farmers’ preferred traits identified 2. New disease-resistant tomato & pepper varieties identified in Bougouni & Koutiala districts. 3. Major vegetable diseases identified for Bougouni & Koutiala districts. 4. Field days & participatory variety selection organized. 5. A report on farmers training and trial establishment. 6. Database on vegetables. 7. Food security implemented. 8. Gender preference for onion & vegetable cowpea varieties established. 9. Finalization of the West Africa Handbook in collaboration with the co-authors as a team | The information from the activity leader indicated that there has been no deviation from the planned milestone | The activity leader informed Mali Africa RISING project coordinator that WorldVeg is preparing an interim report to submit to the donor by the end of March 2020. |
|  | Sub-activity: MA1121-19 Efficient feed utilization through improved feed troughs. | 1. Findings on testing and evaluation of the improved feed troughs compared to traditional practice.  2. Data on use of improved feed trough.  3. Finalization of the west Africa Handbook in collaboration with the co-authors as a team. | There are no deviations from the planned milestones. | Data collection on the use of improved feed troughs is still ongoing. Result to be analyzed and reported in the final report. |
|  | Sub-activity MA1122-19: Fodder production for improved ruminant productivity | 1. Report on fodder production at the Technology Park  2. Field day participation | There is deviation in the planned milestone. | There is nothing to report. The sub-agreement (ICRISAT-ILRI) was fully signed in December 2019. Hence, this sub-activity which ought to have started during the rainy season (July) in 2019 has been shifted to the rainy season of 2020 (July 2020). |
|  | Sub-activity: MA1131-19:  Risk management and informed decision making towards sustainable intensification of crop-livestock systems | 1. Conference presentation on scenario analysis. 2. Conference presentation on risk analysis. 3. Draft paper on risk mitigation strategies. 4. Farm planning and budgeting tool shared | There are no deviations from the planned milestone | 1. WUR Master thesis by Dirk Jakob Hambuechen, looking at the effect of future scenarios on several indicators was finalised in September 2019. <https://edepot.wur.nl/507494>. Results presented at the Farming Systems Design Conference, Montevideo, August 2019. 2. Results on severity and frequency quantifying of risks perceived by farmers was presented at the Farming Systems Design Conference, Montevideo, August 2019. Paper submitted to Agricultural Systems, January 2020. 3. Diversity in perception and management of farming risks in southern Mali. Manuscript submitted for review to Agricultural Systems 4. Farm planning and budgeting tool data and scripts available <https://bscmsc.pps.wur.nl/assessment-potential-future-sustain-ability-smallholder-farming-old-cotton-basin-mali> |
|  | Sub-activity  MA1211-19: Determination of cropping management factors using empirical relations, GIS and Remote Sensing tools in two agro-ecologies of Mali | 1. Spatial distribution map of soil erosion impact on soil productivity.  2. Shapefiles of soil erodibility and erosivity factors.  3. Classified vulnerability of landscape pattern from multidisciplinary approach based on remote sensing (RS) and geographical information system (GIS).  4.Assessed household perception on land management strategies for reducing soil erosion and improving soil fertility.   1. Finalization of the west Africa Handbook in collaboration with the co-authors as a team. Title: Improved land and water management practices on crop productivity and erosion control-lessons from southern Mali | There are no deviations from the planned milestone | 1. Soil erosion maps showing annual soil losses in the districts of Bougouni and Koutiala were produced. 2. Shapefiles of soil erodibility and erosivity are prepared and ready to be shared. |
|  | Sub-activity MA1212-19: Improving crop livestock productivity and household income through the use of contour bunding and agroforestry options. | 1. Data on agronomic and tree growth 2. PhD Thesis submitted by Mr Cheick Oumar Dembele at Bamako University 3. Experimental layout and nurseries established, and business model developed 4. Finalization of the West Africa Handbook in collaboration with the co-authors as a team Title: Soil erosion control and moisture conservation using contour ridge tillage in Bougouni and Koutiala in southern Mali | There are no deviations from the planned milestone | 1. Farmers trained on tree nursery establishment and CBT operation. 2. Fodder plants on the crests of CB were protected by wooden fence and thorny branches 3. Data analyses highlighted that contour bunding technology (CBT) increased trees growth and trees development. |
|  | Sub-activity MA1221-19: Improved irrigation technologies for efficient and sustainable agricultural water management in rural Mali | 1. A comprehensive report on existing initiatives and constraints of using solar energy based pumps and improved irrigation practices. 2. Work modalities established with public private partners through multi-stakeholder engagements to use solar energy based pumps and irrigation technologies and promote at scale. 3. Multi criterial decision making (MCDM) tool developed as a planning and management solutions to assess the potential of agricultural water management investments | There are no deviations from the planned milestone. | Survey data information on existing initiatives and practices of utilizing solar energy-based pumps and improved irrigation practices in Koutiala and Bougouni districts were collected. The survey data applied Sustainable Intensification Assessment Framework (SIAF) domains and presently data cleaning and analysis are on-going. Results will be reported in the final report. |

**Table 2: Achievements (progress and/or results) against outputs towards outcome 4**

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| **Project Outcome 4: Effective partnerships are built with farmers, local communities, and research and development partners in the private and public sectors to ensure delivery and uptake at scale of SI technologies, innovations and practices.** | | | | |
| Output 4.1: Alliances and effective partnerships developed between farmers, local communities, and research and development agents in the public and private sectors to enable the release, dissemination, and adoption of proven technologies and practices at scale. | Planned Activities  1. Hold 4 consultation meetings with PIs leading the implementation of SI technologies in various domains (nutrition, livestock, and crop production).  2. Literature review and conceptualization to generate insights on potential SI adoption impacts framework.  3. Design of survey instruments (household surveys).  4. Household survey data collection on socio-economic, productivity and ecologically variables.  5. Data analysis and synthesis of results (simulation of potential impacts of specific SI technologies adopted).  6. Hold stakeholder knowledge sharing and validation event.  7. Policy dialogue organized with stakeholders.  8. Compilation and submission of technical and financial reports. September 2020.  9. Write and submit journal article and policy brief for publication | Planned Milestones  1.1 Insights on potential SI adoption impacts of selected validated technologies/practices generated. **September 2019**  2.1 Summarized synthesis of literature on simulation and adoption of potential impacts of selected SI technologies by **October 2019**  3.1 Household survey instruments covering relevant socio-economic, productivity and ecologically variables developed by **January 2020.**  4.1 Household survey and data collected done by **March 2020.**  5.1 Generate and submit datasets by **December 2020**  5.2 Simulation analysis to be done by 20th **June 2020**  6.1 Proceedings and synthesis of stakeholder knowledge sharing and validation workshop organized by **July 2020.**  7.1 Policy briefs and Journal articles by **August 2021.**  First interim report is due 31/3/2020.  Final report is due 31/09/2020 | Deviation from Planned Milestones  Consultations with PI on nutrition yet to be done.  Nil  Nil  Nil | Achievements towards Output  Discussions held with 3 members working on the chosen technologies which has helped in research design.  Comprehensive review of relevant literature on adoption simulation modelling (theoretical and empirical) done, analytical framework developed, and draft synthesised report compiled.  2 survey instruments developed ( households, technology generators/disseminators)  Household survey conducted from 2nd -23rd March 2020  Yet to be done  Submitted on 30/3/20 |

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| Project Outcome 2: Outcome 2: **More farmers and farm families in the intervention communities are adopting technologies and practices to improve nutrition, food and feed safety, post-harvest handling and value addition.** | | | | |
| Output/Activity | Planned Activities | Planned Milestone | Deviation from Planned Milestone | Achievements towards output |
| Output 2.2: **Postharvest technologies and practices to provide options for the food, and feed sectors are tested and disseminated to farmers through researchers, extension staff, and development partners.** | Activity 2.2.2: **Build capacity of farm families to reduce postharvest losses.** Sub-activity MA2221-19: Reduce vegetable postharvest losses through dissemination of Zero Energy Cool Chamber (ZECC) and processing of vegetables and capacity building in dry season in Bougouni and Koutiala). | **450 farmers trained on best postharvest and processing practices and awareness**  * Zero energy cooling chambers constructed * Field days & participatory variety selection organized | The information from the activity leader indicated that there is no deviation from the planned milestone | The activity leader informed Mali Africa RISING project coordinator that WorldVeg is preparing an interim report to submit to the donor by the end of March 2020. |

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| Project Outcome 4: Outcome 4: Effective partnerships are built with farmers, local communities, and research and development partners in the private and public sectors to ensure delivery and uptake at scale of SI technologies, innovations and practices. | | | | |
| Output/Activity | Planned Activities | Planned Milestone | Deviation from Planned Milestone | Achievements towards output |
| Output 4.1: **Alliances and effective partnerships developed between farmers, local communities, and research and development agents in the public and private sectors to enable the release, dissemination, and adoption of proven technologies and practices to scale.** | Activity 4.1.1: Conduct cost-benefit and gender analysis coupled with other socio-economic analyses to identify and quantify adoption constraints and opportunities for different farmer contexts.    Sub-activity MA4111-19: Determine farmers’ preferences of technology attributes in cereal-legume systems of southern Mali. | 1. Focus group discussion (FGD) of farmers and key informants (one discussion group per village with 5 to 10 participants). 2. Household survey 3. Journal paper | There are no deviations from the planned milestone | Qualitative data collection on FGD was completed   1. Technical report will be completed with data from household survey 2. Data analysis is on-going |
| Output 4.3: **A framework for monitoring and evaluating technology adoption, and technology-associated risk accessible to the project team and scaling partners** | Activity 4.3.1: Monitor and modify the progress of technology adoption process towards scaling.  Sub-activity MA4311-19: Evaluation of the effect of the implementation of community local conventions for natural resource management in southern Mali | Report of the perceived effect of the local conventions on natural resource management | There are no deviations from the planned milestone | Design of survey instruments prepared for group discussions and individual interviews. |
| Activity 4.3.1: Monitor and modify the progress of technology adoption process towards scaling.  Sub-activity MA4312-19: Assess the impact of Innovation Platforms on SI technology uptake in Africa RISING interventions communities. | 1. Impact assessment report 2. Report on multi stakeholder meeting, attendance list of members of IP. 3. Publication on women and youth participation in multi stakeholder platform. | There are no deviations to the planned activities. | Data analysis was finalized and results revealed that in the years 2018 and 2019 technology adoption is dynamic and depends on the availability at an affordable cost, its easiness of application and social acceptability. |
| Activity 4.3.1: Monitor and modify the progress of technology adoption process towards scaling.  Sub-activity MA4313-19: GIS mapping of implemented technologies across different agro-ecologies and gender influence in technology adaptation and use in Bougouni and Koutiala districts of Mali | 1. Freely available land use and land cover maps, changes detection map from Landsat at 30 m resolution. 2. Scientific article on context domain of technologies in Koutiala and Bougouni districts 3. Scientific article on Gender Influence in Technology adaptation and use | There are no deviations to the planned activities. | 1. Change detection analysis on landuse land cover status for Bougouni and Koutiala districts completed. 2. Innovative technology adoption status by villages conducted for the two districts (Bougouni and Koutiala). |
| Activity 4.4.1: Establish knowledge-sharing and learning alliances among scaling actors.  Sub-activity MA4411-19: Operation of four technology parks as hubs for research and demonstration in Bougouni and Koutiala | 1. Biophysical database on improved technological practices and participatory research in the technology parks. 2. Types of technologies disseminated, capacity building, farmers’ field visit and video demonstration. | There are no deviations to the planned activities. | Several technologies have been demonstrated in the four technology parks.  Farmers field days were organized in the technology parks and attracted over 600 participants in both Bougouni and Koutiala. |